Modeling the Kerr effect in polymer-disordered liquid crystals\(^1\)
LENA M. LOPATINA, JONATHAN V. SELINGER, Liquid Crystal Institute, Kent State University — In the Kerr effect, an electric field applied to an optically isotropic material induces orientational order and hence induces optical birefrin- gence. Recently, many investigators have used the Kerr effect to develop liquid-crystal displays and other electro-optic devices that can operate at high speed and with no need for aligning substrates. This application requires a large and fairly temperature-independent Kerr coefficient. One approach to achieve this goal is by using liquid-crystal blue phases, perhaps with polymer stabilization. As an alternative approach, D.-K. Yang has suggested using a nematic phase within a disordered polymer network. This structure would be disordered and optically isotropic in the absence of a field, but it would develop order and birefringence under an applied field. To assess this approach, we perform Monte Carlo simulations of a nematic liquid crystal in a disordered polymer network, and calculate the response to an applied field. We compare the results with analytic studies of liquid crystals under quenched disorder and with experiments.

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